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**91037**

B.Sc. (Chemistry Hons.) 1st Semester  
(Full & Reappear)  
Examination, March-2021  
(w.e.f. 2012-13)

**MATHEMATICS-I OPTIONAL**

Time : Three Hours ]

[ Maximum Marks : 40

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note :- Attempt five questions in all, selecting one question from each Section. Question No. 9 (Section V) is compulsory. All questions carry equal marks.

**Section-I**

1. (a) Find the domain and range of the following functions :

$$y = \frac{|x|}{x}, x \neq 0$$

- (b) Solve the equation  $4x^3 + 16x^2 - 9x - 36 = 0$ , the sum of two of the roots being zero. 4,4

2. (a) How many words can be formed from the letters of the word DAUGHTER ?  
(i) Taking all the letters together  
(ii) Beginning with D and ending with R  
(b) Find the term independent of  $x$  in the

expansion of  $\left(2x + \frac{3}{x^2}\right)^9$ . 4,4

**Section-II**

3. (a) Show that :

$$\frac{\sin 2A}{1 - \cos 2A} = \cot A$$

- (b) If  $\tan(x+y) = \frac{3}{4}$ ,  $\tan(x-y) = \frac{8}{15}$ , then

show that  $\tan 2x = \frac{77}{36}$ . 4,4

4. (a) Evaluate :

$$\lim_{x \rightarrow 0} \frac{\tan x - \sin x}{x^3}$$

- (b) If the function :

$$f(x) = \begin{cases} 3ax + b & \text{if } x > 1 \\ 11 & \text{if } x = 1 \\ 5ax - 2b & \text{if } x < 1 \end{cases}$$

is continuous at  $x = 1$ , find the values of  $a$  and  $b$ . 4,4

**Section-III**

5. (a) Differentiate the following function w.r.t.  $x$ :

$$y = \frac{x + \sin x}{x + \cos x}$$

(b) Find  $\frac{dy}{dx}$  for the following equation :

$$xy - x^3 + y^2 = 0 \quad 4,4$$

6. (a) Find  $\frac{dy}{dx}$  for the following parametric equations :

$$x = 2 \cos \theta - \cos 2\theta,$$

$$y = 2 \sin \theta - \sin 2\theta$$

(b) Find the local maxima and local minima, if any, of the function  $f(x) = x^3 - 12x^2 + 36x - 4$ . Find also the local maximum and local minimum values. 4,4

**Section-IV**

7. (a) Evaluate :

$$\int x^3 e^{4x} dx$$

(b) Evaluate :

$$\int \frac{dx}{(x-1)(x+2)(x-3)} \quad 4,4$$

8. (a) Find a reduction formula for :

$$\int \tan^n x dx$$

(b) Evaluate :

$$\int_0^2 \int_0^1 x^2 y^3 dy dx \quad 4,4$$

**Section-V**

9. (a) If  $A = \{a, b, c, d\}$ ,  $B = \{b, d, e, f\}$  and  $C = \{e, d, g, b\}$ . Find  $A \cup B$  and  $B \cap C$ .

(b) Find a quadratic equation whose sum of roots is 5 and product is 6.

(c) Solve  $\sin x + \cos x = 1$ .

(d) Evaluate :

$$\lim_{x \rightarrow 0} \frac{\sin x^2}{x}$$

(e) If  $y = x^4 + 7x^3 + 8x^2 + 3x + 2$ , find  $\frac{dy}{dx}$ .

(f) Differentiate  $x^2 \cdot e^x$  w.r.t.  $x$

(g) Evaluate :

$$\int \frac{dx}{50 + 2x^2}$$

(h) Evaluate :

$$\int_1^2 \frac{3x}{9x^2 - 1} dx \quad 1 \times 8 = 8$$